

**Blue Smart IP67 Charger 120V**  
**Cargador Blue Smart IP67 120V**

<b>12/7</b>	<b>24/5</b>
<b>12/13</b>	<b>24/8</b>
<b>12/17</b>	<b>24/12</b>
<b>12/25</b>	

## IMPORTANT SAFETY INSTRUCTIONS

1. **SAVE THESE INSTRUCTIONS** – This manual contains important safety and operating instructions for Blue Smart Charger models.
2. Use of an attachment not recommended or sold by Victron Energy may result in a risk of fire, electric shock, or injury to persons.
3. To reduce risk of damage to electric plug and cord, pull by plug rather than cord when disconnecting charger.
4. An extension cord should not be used unless absolutely necessary. Use of an improper extension cord could result in a risk of fire and electric shock. If extension cord must be used, make sure:
  - a) That pins on plug of extension cord are the same number, size, and shape as those of plug on charger;
  - b) that extension cord is properly wired and in good electrical condition; and
  - c) that wire size is large enough for ac ampère rating of charger as specified in “Technical Specifications”
5. Do not operate the charger with damaged cord or plug; contact your service agent or the manufacturer.
6. Do not operate the charger if it has received a sharp blow, been dropped, or otherwise damaged in any way; contact your service agent or the manufacturer.
7. Do not disassemble the charger; contact your service agent or the manufacturer when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
8. To reduce risk of electric shock, unplug charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
9. **WARNING – RISK OF EXPLOSIVE GASES.**
  - a) **BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE USING YOUR CHARGER, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.**



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- b) Follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in vicinity of the battery.
10. PERSONAL PRECAUTIONS
- a) Consider having someone close enough by to your aid when you work near a lead-acid battery.
  - b) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
  - c) Wear complete eye protection and clothing protection. Avoid touching eyes while working near a battery.
  - d) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.
  - e) NEVER smoke or allow a spark or flame in vicinity of a battery or engine.
  - f) Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit the battery or another electrical part that may cause explosion.
  - g) Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.
  - h) Do not use the battery charger for charging dry-cell batteries that are commonly used with home appliances. These batteries may burst and cause injury to persons and damage to property.
  - i) NEVER charge a frozen battery.
11. PREPARING TO CHARGE
- a) If it is necessary to remove the battery from a vehicle prior to charging, always remove the grounded terminal from the battery first. Make sure all accessories in the vehicle are off, so as not to cause an arc.
  - b) Be sure that the area around the battery is well ventilated while the battery is being charged.
  - c) Clean battery terminals. Be careful to keep corrosion from coming in contact with eyes.



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- d) Add distilled water in each cell until battery acid reaches level specified by battery manufacturer. Do not overfill. For a battery without cell caps, such as valve regulated lead acid batteries, carefully follow the charging instructions of the manufacturer.
  - e) Study all battery manufacturer's specific precautions while charging and recommended rates of charge.
  - f) Determine the nominal voltage of the battery by referring to the owner's manual of the vehicle and make sure it matches the output rating of the battery charger.
12. CHARGER LOCATION
- a) Locate the charger as far away from the battery as DC cables permit.
  - b) Never place charger directly above battery being charged; gases from battery will corrode and damage the charger.
  - c) Never allow battery acid to drip on the charger when reading gravity or filling the battery.
  - d) Do not operate the charger in a closed-in area or restrict ventilation in any way.
  - e) Do not set a battery on top of the charger.
13. DC CONNECTION PRECAUTIONS
- a) Connect and disconnect the DC output terminals only after removing the AC cord from the electric outlet. Never allow terminals to touch each other.
  - b) Attach terminals to battery and chassis as indicated in 14(e), 14(f), 15(b), and 15(d).
14. FOLLOW THE FOLLOWING STEPS WHEN THE BATTERY IS INSTALLED IN A VEHICLE. A SPARK NEAR THE BATTERY MAY CAUSE A BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR BATTERY:
- a) Position AC and DC cords to reduce risk of damage by hood, door, or moving engine part.
  - b) Stay clear of fan blades, belts, pulleys, and other parts that can cause injury to persons.
  - c) Check polarity of battery posts. POSITIVE (POS, P, +) battery post usually has larger diameter than NEGATIVE (NEG, N,-) post.



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- d) Determine which post of battery is grounded (connected) to the chassis. If the negative post is grounded to the chassis (as in most vehicles), see (e). If the positive post is grounded to the chassis, see (f).
  - e) In case of a negative-grounded vehicle, connect the POSITIVE (RED) terminal from the battery charger to the POSITIVE (POS, P, +) ungrounded post of the battery. Connect the NEGATIVE (BLACK) terminal to the chassis or engine block of the vehicle, away from battery. Do not connect the terminal to the carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or the engine block. Connect the AC cord to the socket.
  - f) In case of a positive-grounded vehicle, connect the NEGATIVE (BLACK) terminal from the battery charger to the NEGATIVE (NEG, N, -) ungrounded post of the battery. Connect the POSITIVE (RED) terminal to the chassis or engine block of the vehicle, away from the battery. Do not connect the terminal to the carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or the engine block. Connect the AC cord to the socket.
  - g) When disconnecting the charger, disconnect the AC cord, remove the terminal from the chassis of the vehicle, and finally remove the terminal from the battery terminal.
  - h) See "charge algorithms" for length of charge information.
15. FOLLOW THESE STEPS WHEN THE BATTERY IS OUTSIDE OF THE VEHICLE. A SPARK NEAR THE BATTERY MAY CAUSE BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR THE BATTERY:
- a) Check the polarity of the battery posts. The POSITIVE (POS, P, +) battery post usually has a larger diameter than the NEGATIVE (NEG, N, -) post.
  - b) Connect the POSITIVE (RED) charger terminal to the POSITIVE (POS, P, +) post of the battery.
  - c) Do not face the battery when making the final connection.



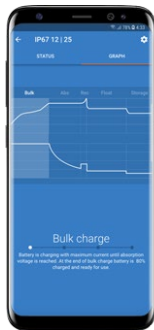
- d) When disconnecting the charger, always do so in reverse sequence of the connecting procedure and break the first connection while as far away from battery as practical.
- e) A marine (boat) battery must be removed and charged on shore. To charge it on board requires equipment specially designed for marine use.



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# 1. Quick user guide

The Blue Power IP67 chargers will charge and maintain lead-acid and Li-ion batteries, and supply users connected to the battery. In addition, the models with suffix (1+Si) feature a second current limited output which is always powered as long as 110 – 130 VAC is present on the input. This output can for example be used to prevent starting of a vehicle before unplugging the battery charger (start interrupt function).



## Blue Smart version

Set-up, monitor and update the charger (add new features when they become available) using Apple and Android smartphones, tablets or other devices with the VictronConnect App.

VictronConnect is available to users of Windows PCs, macOS X, iOS and Android phones, as well as tablets.




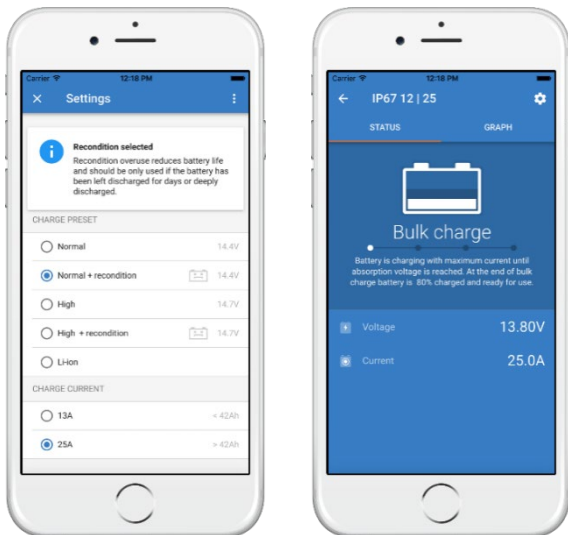
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## VictronConnect: Blue Smart IP67 charger pages

When the Blue Smart charger is powered-up it will be discoverable using the VictronConnect app on your device.

The 'home' page shows information about the battery voltage, charge current, and where your battery is in the charging-cycle.

To access the Settings button click on the cog icon  at the top right of the screen. From here you can choose a preset charge algorithm, you can select the charge current; and you can choose to employ the charge algorithm for a Li-ion battery when that is appropriate.



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### **Installation and instructions for use**

1. The battery charger must be installed in a well-ventilated area close to the battery (but, due to possible corrosive gasses not above the battery!)
2. Connect the ring terminals to the battery: the minus cable (black) to the minus (-) pole of the battery, the plus cable (red) to the plus (+) pole of the battery.
3. Plug the AC mains cable into the wall socket. The charge cycle will now start.

### **Two LEDs for status indication**

Yellow LED: bulk charge (blinking fast), absorption (blinking slow), float (solid), storage (off)

Green LED: power on

### **Safety regulations and measures**

1. Install the charger according to the stated instructions
2. Connections and safety features must be executed according to the locally applicable regulations.
3. Warning: do not attempt to charge non-rechargeable batteries.
4. Warning: a BMS (Battery Management System) may be required to charge a Li-ion battery.
5. This appliance is not intended for use by persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
6. The charger is designed for lead-acid and Li-ion batteries 14-225Ah. Do not use for any other purpose.



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## 2. 'Must know' features and facts

### 2.1 Ultra high efficiency "green" battery charger

With up to 95% efficiency, these chargers generate up to four times less heat when compared to the industry standard.

And once the battery is fully charged, power consumption reduces to 0.5 Watt, some five to ten times better than the industry standard.

### 2.2 Durable, safe and silent

- Low thermal stress on the electronic components.
- Protection against ingress of dust, water and chemicals.
- Protection against overheating: the output current will reduce as temperature increases up to 60°C (140°F), but the charger will not fail.
- The chargers are totally silent: no cooling fan or any other moving parts.

### 2.3 Reverse polarity protected

In case of wrong polarity connection, the external ATO blade fuse will blow. Check the polarity of the cable and check the correct value before replacing the fuse.

### 2.4 Recovery function for fully discharged batteries

Most reverse polarity protected chargers will not recognize, and therefore not recharge a battery which has been discharged to zero or nearly zero Volts. The *Blue Smart IP67 Charger* however will attempt to recharge a fully discharged battery with low current and resume normal charging once sufficient voltage has developed across the battery terminals.

### 2.5 Temperature compensated charging

The optimal charge voltage of a lead-acid battery varies inversely with temperature. The *Blue Smart IP67 Charger* measures ambient temperature during the test phase and compensates for temperature during the charge process. The temperature is measured again when the charger is in low current mode during float or storage. Special settings for a cold or hot environment are therefore not needed.



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## 2.6 Adaptive Battery Management

Lead-acid batteries should be charged in three stages, which are [1] *bulk or constant-current charge*, [2] *absorption or topping charge* and [3] *float charge*.

Several hours of absorption charge are needed to fully charge the battery and prevent early failure to sulfation<sup>1</sup>.

The relatively high voltage during absorption does however accelerate aging due to grid corrosion on the positive plates.

*Adaptive Battery Management* limits corrosion by reducing absorption time when possible, that is: when charging a battery that is already (nearly) fully charged.

## 2.7 Storage mode: less corrosion of the positive plates

Even the lower float charge voltage that follows the absorption period will cause grid corrosion. It is therefore essential to reduce the charge voltage even further when the battery remains connected to the charger during more than 48 hours.

## 2.8 Reconditioning

A lead-acid battery that has been insufficiently charged or has been left discharged during days or weeks will deteriorate due to sulfation<sup>1</sup>. If caught in time, sulfation can sometimes be partially reversed by charging the battery with low current up to a higher voltage.

Remarks:

- a) Reconditioning should be applied only occasionally to flat plate VRLA (gel and AGM) batteries because the resulting gassing will dry out the electrolyte.
- b) Cylindrical cell VRLA batteries build more internal pressure before gassing and will therefore lose less water when subjected to reconditioning. Some manufacturers of cylindrical cell batteries therefore recommend the reconditioning setting in case of cyclic application.
- c) Reconditioning can be applied to flooded batteries to "equalise" the cells and to prevent acid stratification.
- d) Some battery charger manufactures recommend pulse charging to reverse sulfation. However, most battery experts agree that there is no conclusive proof that pulse charging works any better than constant voltage charging. This is confirmed by our own tests.



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## 2.9 Lithium-ion (LiFePO<sub>4</sub>) batteries

Li-ion batteries do not suffer from sulfation.

But Li-ion batteries are very sensitive to under voltage or over voltage<sup>2</sup>.

Li-ion batteries therefore often have integrated cell balancing and under voltage protection (UVP) circuitry.

Some reverse polarity protected chargers will not recognize a battery when the UVP has tripped.

The *Blue Power Charger* will however automatically reset the UVP and start charging.

### Important note:

**NEVER attempt to charge a Li-ion battery when its temperature is below 0°C (32°F).**

## 2.10 Low current mode

Some lead acid batteries can overheat if charged with a current exceeding 0.3C (C is the capacity in Ah. A 12Ah battery for example should not be charged with a current exceeding  $0.3 \times 12 = 4A$ ). The low current mode (charge current limited to 4A or less, see technical specifications) should therefore be used to charge low capacity lead-acid batteries.



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### 3. Charge algorithms

#### 3.1 Smart charge algorithm with optional reconditioning for lead-acid batteries

Charge voltages at room temperature:

MODE	ABS V	FLOAT V	STORAGE V	RECONDITION Max V@% of Inom
NORMAL	14.4	13.8	13.2	16.2@8%, max 1h
HIGH	14.7	13.8	13.2	16.5@8%, max 1h
LI-ION	14.2	13.5	13.5	n. a.

*For 24V chargers: multiply all voltage values by 2.*

NORMAL (14.4V): recommended for flooded flat plate lead antimony batteries (starter batteries), flat plate gel and AGM batteries.

HIGH (14.7V): recommended for flooded lead calcium batteries, Optima spiral cell batteries and Odyssey batteries.

#### State of the art microprocessor controlled charge algorithm

##### Adaptive 5-stage charge characteristic: bulk – absorption – recondition - float – storage

The Blue Power IP67 charger features a microprocessor controlled 'adaptive' battery management system. The 'adaptive' feature will automatically optimise the process relative to the way the battery is being used.

##### 1. BULK

Charges the battery with maximum current until absorption voltage is reached. The battery will then be about 80% charged and is ready for use.

##### 2. ABS - Absorption

Charges the battery at constant voltage and with decreasing current until it is fully charged.

See table above for absorption voltage at room temperature.

*Adaptive battery management:*



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*The absorption time is short (minimum 30 minutes) if the battery was (nearly) fully charged and increases to 8 hours in case of a deeply discharged battery.*

**3. RECONDITION**

Optional reconditioning for deeply discharged lead-acid batteries.

Reconditioning is applicable to the charge algorithms NORMAL and HIGH and can be selected by pressing the MODE button one more time after selection of the required algorithm.

When in RECONDITION mode the battery will be charged with low current up to a higher voltage at the end of the absorption phase.

The RECONDITION LED will be on during charging, and will blink during the reconditioning period.

During reconditioning the maximum current is equal to 8% of the nominal current until the maximum voltage is reached.

Reconditioning is terminated after one hour or when the maximum voltage is reached, whichever comes first. See *table*.

*Example:*

*For a 12/7 charger: the recondition current is  $7 \times 0.08 = 0.56A$*

**4. FLOAT**

Keeps the battery at constant voltage and fully charged.

**5. STORAGE**

Keeps the battery at reduced constant voltage to limit gassing and corrosion of the positive plates.

Slow self-discharge is prevented by an automatic weekly refresh of the battery with a short absorption charge.

### **3.2 Lithium-ion (LiFePO<sub>4</sub>) batteries**

When charging a Lithium-ion battery, the *Blue Smart IP67 Charger* uses a specific charging algorithm for Lithium-ion batteries, to ensure optimum performance. *Select LI-ION with the app on your smart phone.*



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### 3.3 When a load is connected to the battery

A load can be applied to the battery while charging, as long as the current draw is much lower than the rated output of the battery charger. Reconditioning is not possible when a load is connected to the battery.

Remarks:

- a) Disconnect all loads before attempting to recharge a very weak or fully discharged lead-acid battery. Loads may be reconnected once the bulk phase has started.
- b) Disconnect all loads before attempting to recharge a Li-ion battery when the under voltage protection (UVP) of the Li-ion battery has tripped. Loads may be reconnected once the bulk phase has started.

### 3.4 Triggering a new charge cycle

A new charge cycle will start when:

- a) The charger has reached float or storage, and, due to a load, current increases up to maximum current during more than four seconds.
- b) The AC supply has been disconnected and reconnected.

### 3.5 Estimating charge time

A lead-acid battery is about 80% charged at the beginning of the absorption period.

The time **T** to 80% charged can be calculated as follows:

$$T = Ah / I$$

Where:

**I** is the charge current (= charger output minus load current).

**Ah** is the amount of Ah to be charged.

A full absorption period of up to 8 hours is needed to charge the battery to 100%.

Example:

Charge time to 80% of a fully discharged 100Ah battery when charged with a 10A *Blue Power Charger*:  $T = 100 / 10 = 10$  hours



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Charge time to 100%:  $10 + 8 = 18$  hours.

A Li-ion battery is more than 95% charged at the beginning of the absorption period, and reaches 100% charge after approximately 30 minutes absorption charge.

### **3.6 High internal resistance**

When a battery reaches the end of its cycle- or float life, or when it dies prematurely due to sulfation or corrosion, capacity will dramatically drop and internal resistance will increase. The charger will not recognise such a battery during the test phase (it could as well be a nearly fully charged battery).

A very short bulk phase when charging a supposedly discharged battery does however indicate that the battery has reached the end of its useful life.

Remark: sulfation can sometimes be partially reversed by repeated application of the RECONDITION MODE.

### **3.7 Can be used as a power supply**

The charger will supply DC loads when no battery is connected.



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## 4. Technical specifications

Blue Smart IP67 Charger 120V	12V 7/13/17/25 A	24V 5/8/12 A
Input voltage range and frequency	100-130 VAC (2-6A) 45 -65Hz	
Standby power consumption	0.5W	
Charge voltage 'absorption'	Normal: 14.4 V, High: 14.7 V Lithium-ion: 14.2 V	Normal: 28.8 V, High: 29.4 V Lithium-ion: 28.4 V
Charge voltage 'float'	Normal: 13.8 V, High: 13.8 V Lithium-ion: 13.5 V	Normal: 27.6 V, High: 27.4 V Lithium-ion: 27.0 V
Charge voltage 'storage'	Normal: 13.2 V, High: 13.2 V Lithium-ion: 13.5 V	Normal: 26.4 V, High: 26.4 V Lithium-ion: 27.0 V
Charge current	7 / 13 / 17 / 25 A	5 / 8 / 12 A
Charge current in low current mode	2 / 4 / 6 / 10 A	2 / 3 / 4 A
Charge characteristic	5-stage adaptive	
Temperature compensation (lead-acid batteries only)	16 mV/°C (9mV/°F)	32 mV/°C (18mV/°F)
Can be used as power supply	Yes	
Protection	Reverse reverse polarity (fuse), Output short circuit	Over temperature
DC fuse, internal and not replaceable	n.a / n.a. / 25 / 35 A	n.a. / 15 / 20 A
DC fuse in DC cable – ATO blade (A)	20 A (12/25: no fuse)	20 / 10 / 15 A
Operating temp. range	-20 to +60°C (full rated output up to 40°C), 0 to + 140°F (full rated output up to 90°F)	
Humidity	Up to 100%	
Start interrupt option (Si)	Short circuit proof, current limit 0.5A, Output voltage: max one volt lower than main output	
<b>ENCLOSURE</b>		
Material & Colour	Aluminium (blue RAL 5012)	
Battery-connection	Black and red cable with M8 ring terminal 1.8 meter (6 feet) 12/7, 12/13, 24/5 - 12 AWG 12/17, 12/25, 24/8, 24/12 - 9 AWG	
120 V AC-connection	Cable of 1.8 meter (6 feet) with US NEMA 5-15 plug	
Protection category	IP67	
Weight	12/7, 12/13, 24/5: 1.8kg (4lbs) 12/17, 12/25, 24/8, 24/12: 2.4kg (5.3lbs)	
Dimensions (h x w x d)	12/7, 12/13, 24/5: 85 x 211 x 60 mm 12/17, 12/25, 24/8, 24/12: 99 x 219 x 65 mm	3.4 x 8.3 x 2.4 inches 3.9 x 8.6 x 2.6 inches
<b>STANDARDS</b>		
Safety	EN 60335-1, EN 60335-2-29 (UL 1236 / CSA C22.2)	
Emission	EN 55014-1, EN 61000-3-2	
Immunity	EN 55014-2, EN 61000-3-3	



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## Maintenance

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The Blue Smart Charger is maintenance free.  
When cleaning the charger remove the plug from the power socket. Then use a damp cloth to clean the exterior.

## Blue Power and Blue Smart IP67 Chargers

The Blue Power IP67 chargers will charge and maintain lead-acid and Li-ion batteries, and supply users connected to the battery.

In addition, the models with suffix (1+Si) feature a second current limited output which is always powered as long as 180 – 265 Vac is present on the input. This output can for example be used to prevent starting of a vehicle before unplugging the battery charger (start interrupt function).

### Blue Smart version only

Set-up, monitor and update the charger (add new features when they become available) using Apple and Android smartphones, tablets or other devices.

### State of the art microprocessor controlled charge algorithm

#### Adaptive 4-stage charge characteristic: bulk – absorption – float – storage

The Blue Power IP67 charger features a microprocessor controlled 'adaptive' battery management system. The 'adaptive' feature will automatically optimise the process relative to the way the battery is being used.

#### The right amount of charge: variable absorption time

When only shallow discharges occur, the absorption time is kept short in order to prevent overcharging of the battery. After a deep discharge the absorption time is automatically increased to make sure that the battery is completely recharged.

#### Less maintenance and aging when the battery is not in use: the Storage Mode

After the absorption period, the Blue Power IP67 charger will switch to float charge and thereafter, if the battery has not been subjected to discharge, the Storage Mode kicks in. In the storage mode float voltage is reduced to 2,2V/cell (13,2V for 12V battery) to minimise gassing and corrosion of the positive plates. Once a week the voltage is raised back to the absorption level to 'equalize' the battery. This feature prevents stratification of the electrolyte and sulphation, a major cause of early battery failure.

### Installation and instructions for use

1. The battery charger must be installed in a well-ventilated area close to the battery (but, due to possible corrosive gasses not above the battery!)
2. Connect the ring terminals to the battery: the minus cable (black) to the minus (-) pole of the battery, the plus cable (red) to the plus (+) pole of the battery.
3. Plug the AC mains cable into the wall socket. The charge cycle will now start.

### LED indication

The green LED will be on when the charger is connected to an AC source.

The yellow LED will blink at a fast rate during bulk charge and at a slower rate during absorption charge. The yellow LED will be on continuously during float charge and will be off during storage mode.

### Safety regulations and measures

1. Install the charger according to the stated instructions
2. Connections and safety features must be executed according to the locally applicable regulations.
3. In case of wrong polarity connection, the external ATO blade fuse will blow (exception: Blue Power 12/25). Check the polarity of the cable and check the correct value before replacing the fuse.
4. Warning: do not attempt to charge non-rechargeable batteries.
5. Warning: a BMS (Battery Management System) may be required to charge a Li-ion battery.
6. If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
7. This appliance is not intended for use by persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
8. The charger is designed for lead-acid and Li-ion batteries 14-225Ah. Do not use for any other purpose.

## Learn more about batteries and battery charging

To learn more about batteries and charging batteries, please refer to our book 'Energy Unlimited'.

<b>Blue Power IP67 Charger Blue Smart IP67 Charger</b>	<b>12/07 12/13</b>	<b>12/17 12/25</b>	<b>24/05</b>	<b>24/08 24/12</b>
Input voltage range	180 – 265Vac or 250 – 350Vdc			
Frequency	45-65 Hz			
Charge voltage 'absorption' (V DC)	14,4		28,8	
Charge voltage 'float' (V DC)	13,8		27,6	
Charge voltage 'storage' (V DC)	13,2		26,4	
Charge current (A)	7 / 13	17 / 25	5	8 / 12
Charge characteristic	4-stage adaptive			
Can be used as power supply	yes			
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature			
DC fuse, internal and not replaceable	no fuse	25 / 35	no fuse	15 / 20
DC fuse in DC cable- ATO blade (A)	20	20 / no fuse	20	10 / 15
Operating temp. range	-20 to +60°C (full rated output up to 40°C)			
Start interrupt option (Si)	Short circuit proof, current limit 0,5A Output voltage: max one volt lower than main output			
<b>ENCLOSURE</b>				
Material & Colour	aluminium (blue RAL 5012)			
Battery-connection	Black and Red cable with M8 ring terminal 12AWG-1,5mtr 12/25: 9AWG-1mtr			
230V AC-connection	Cable of 1,5 meter with Europe class 1 plug (CE certified)			
Protection category	IP67			
Weight (kg)	1,8	2,4	1,8	2,4
Dimensions (h x w x d in mm)	85 x 211 x 60	99 x 219 x 65	85 x 211 x 60	99 x 219 x 65
<b>STANDARDS</b>				
Safety	EN 60335-1, EN 60335-2-29			
Emission	EN 55014-1, EN 61000-3-2			
Immunity	EN 55014-2, EN 61000-3-3			

